COMMANDING OFFICER
NETPMSA
6490 SAUFLFY FIELD ROAD
PENSACOLA, FLORIDA 32509-5000

ERRATA #1 November 1995

Specific changes for
NAVY ELECTRICITY AND ELECTRONICS TRAINING SERIES
MODULE 21-TEST METHODS AND PRACTICES
RATE TRAINING MANUAL (RTM) NAVEDTRA B72-21-00-87

1. TO OBTAIN CREDIT FOR DELETED QUESTIONS, SHOW THIS ERRATA TO YOUR LOCAL COURSE ADMINISTRATOR (ESO/SCORER). THE ESO/SCORER IS DIRECTED TO CORRECT THE ANSWER KEY BASED ON THE CHANGES INDICATED BELOW.

2. No attempt has been made to issue corrections for errors in typing, punctuation, etc., which do not affect your ability to answer the questions.

3. See enclosure (1) for specific instructions on figure and page changes.

4. Make the following changes in your NEETS Module 21, NAVEDTRA B72-21-00-87, before you begin study:

PAGE	**DESCRIPTION**
1-2	Pen and ink change—add "Operation and use of common test equipment was covered in NEETS Module 16, *Introduction to Test Equipment*, NAVEDTRA B72-16-00-95. It is recommended that you review this module before continuing.
1-5	Pen and ink change—under "Electronic Voltmeter Method"—delete Figure 1-4.—Vacuum tube voltmeter (vtvm). Pen and ink change—delete question number Q5. Pen and ink change—delete all text for vtvm.
1-6	Pen and ink change—delete answer A5.

PAGE	DESCRIPTION
1-8	Pen and ink change—under "Vacuum Tube Voltmeter Method"—delete paragraph.
1-13	Pen and ink change—under "VTVM METHOD"—delete paragraph on AN/USM-116. Pen and ink change—under "RCL BRIDGE," paragraph 1, sentence 1—change "ZM-11/U" to "250DE+1325."
1-15	Pen and ink change—In paragraph 1—change second sentence to read "An authorized general-purpose safety shorting probe for naval service application may be requisitioned using the current stock number listed in the ELECTRONICS INSTALLATION AND MAINTENANCE BOOK (EIMB), General, NAVSEA 0967-LP-000-0100, Section 3, Safety Equipment."
1-17	Pen and ink change—under "HAY BRIDGE," paragraph 1, sentence 9—change "ZM-11/U" to "250DE+1325."
1-19	Figure 1-15.—Bridge circuits.—replace with new page 1-19 in accordance with enclosure (1).
1-22	Pen and ink change—In paragraph 1, sentence 2—delete "or vtvm." Pen and ink change—delete vtvm figure (second figure).
1-23	Replace old page 1-23 with new page 1-23 in accordance with enclosure (1).
2-10	Figure 2-4.—Semiconductor test set.—replace in accordance with enclosure (1).
2-33	Following "AUTOMATIC TEST EQUIPMENT" text-add HUNTRON TRACKER 2000 pages 2-33a1 through 2-33a5 in accordance with enclosure (1).

PAGE	DESCRIPTION
2-33	Paragraph 1—cut and paste paragraph 1 in accordance with enclosure (1).
2-35	Replace old page 2-35 with new page 2-35 in accordance with enclosure (1).
2-36	Pen and ink change—add reference for Huntron Tracker 2000, *"Huntron Tracker 2000 Operation and Maintenance Manual*, P/N 21-1052, Huntron Instruments, Inc., 15720 Mill Creek Blvd., Mill Creek, WA 98012."
3-14	Pen and ink change—under "VACUUM TUBE VOLTMETER"—change to read "ELECTRONIC WATTMETER."
	Pen and ink change—under "ELECTRONIC WATTMETER" in paragraph 1, sentence 1—delete "or vacuum tube."
3-15	Pen and ink change—under "ELECTRONIC WATTMETER" in paragraph 1, sentence 10—change "vtvm" to read "electronic wattmeter."
	Pen and ink change—change question Q12 to read "For power measurements, what advantage does an electronic wattmeter have over an electrodynamic wattmeter?"
3-16	Pen and ink change—change answer A12 to read "Electronic wattmeters are capable of measuring high-frequency signals."
4-1	Pen and ink change—in paragraph 2, last sentence, last word—change the word "trouble" to "problem."
5-15	Pen and ink change—in the text in Figure 5-23.—Pulsed radar changes caused by modulating signal changes. Reading "CHANGE IN PULSE **WITH** CHANGES NUMBER OF LOBES"—change the word "**WITH**" TO "**WIDTH**."
I-5	Pen and ink change—under "V"—delete "Vacuum tube voltmeter, 3-14 to 3-15."

CHANGE SHEET
NAVEDTRA B72-21-00-87

Replace page 1-19, Figure 1-15.—Bridge circuits. With new page 1-19.

Replace page 1-23, REFERENCES, with new page 1-23.

Cut and paste page 2-10, Figure 2-4.—Semiconductor test set. With the following figure.

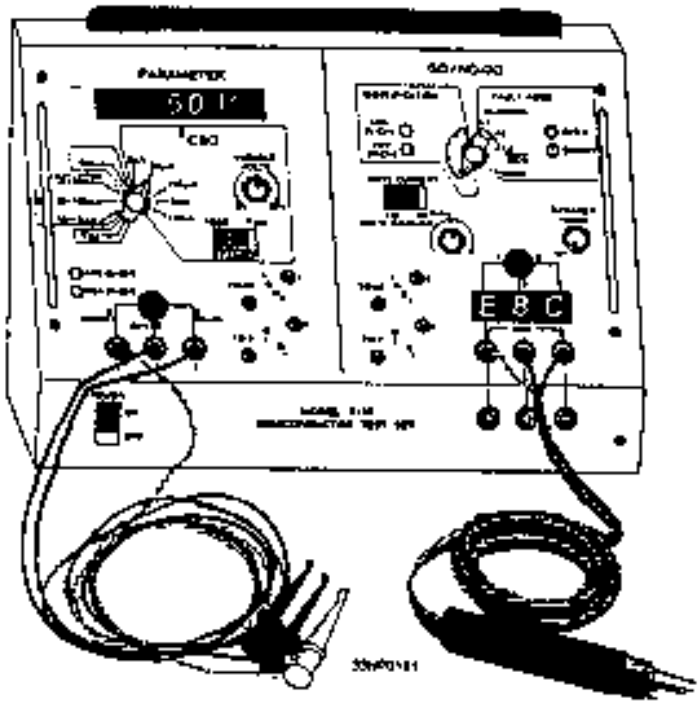


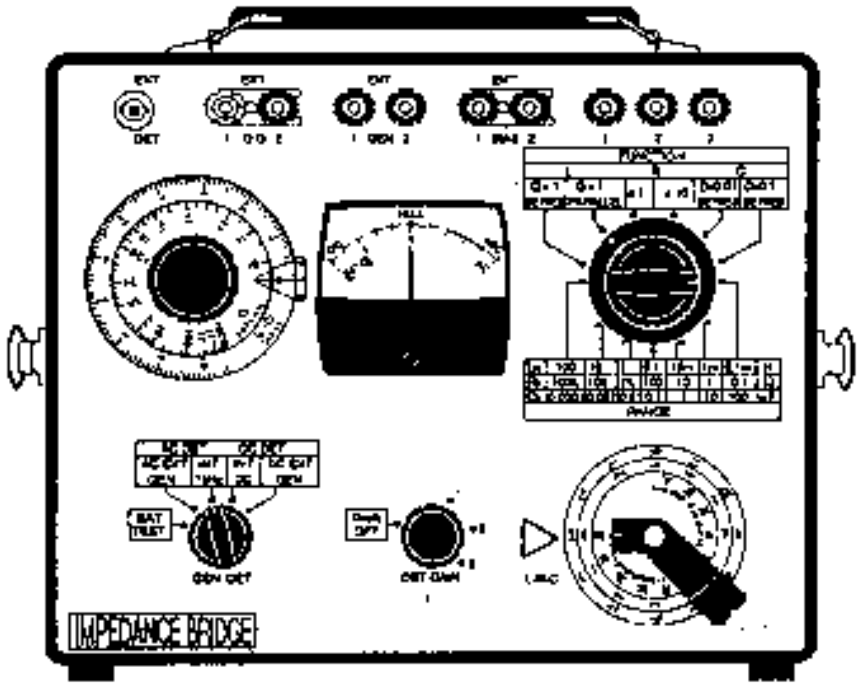
Figure 2-4.—Semiconductor test set.

Insert pages 2-33a1 through 2-33a5, Huntron Tracker 2000, and replace page 2-35 with new page 2-35.

Enclosure (1)

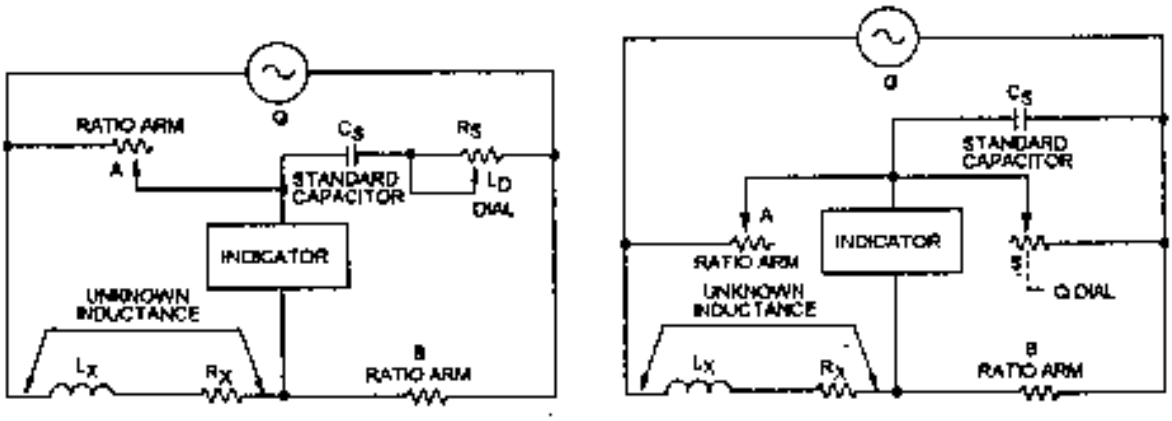
Cut and paste the following paragraph over the first paragraph on page 2-33.

The AN/USM-465 is part of the Support and Test Equipment Engineering Program (STEEP). It provides on-site screen testing and fault isolation of digital pcb's and modules. The psp is presently available on most ships and shore intermediate maintenance activities (SIMA) with Mini/Micro maintenance stations (2M). Psp's come with maintenance-assist modules (spare parts kit) and diagnostic kits.



CAPACITANCE-INDUCTANCE-RESISTANCE BRIDGE

(A)



HAY BRIDGE

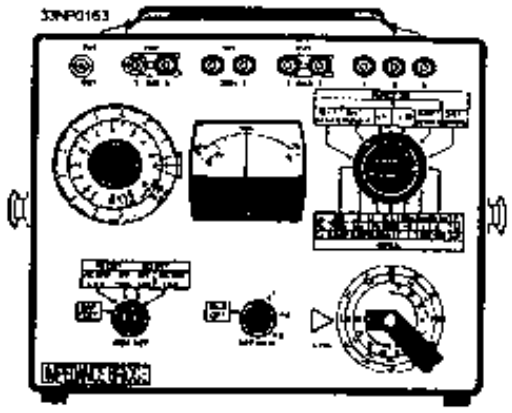
(B)

MAXWELL BRIDGE

(C)

Figure 1-15.—Bridge circuits.

Capacitance and inductance measurements are seldom required in the course of troubleshooting. These measurements are usually performed with various types of **BRIDGES** or with a reactance type of measuring device. The bridge-measuring techniques are more commonly used and are more accurate than reactance types of measurements.



REFERENCES

8000 Digital Multimeter, NAVSEA 0960-LP-279-9010, Naval Sea Systems Command, Washington, D.C., undated.

EIMB, *Test Methods and Practices Handbook*, NAVSEA 0967-LP-000-0130, Naval Sea Systems Command, Washington, D.C., 1980.

EIMB, *General*, NAVSEA 0967-000-0100, Naval Sea Systems Command, Washington, D.C., 1983.

Instruction Manual for Universal Impedance Bridge, Model 250DE, 13202, Electro Scientific Industries, 13900 N. W. Science Park Drive, Portland, Oregon, 97229, March 1971.

Instruction Manual, *Model 893A/AR AC-DC Differential Voltmeter*, NAVSEA 0969-LP-279-7010, Naval Sea Systems Command, Washington, D.C., 1969.

Operation and Maintenance Instruction, Current Tracer 547A, NAVAIR 16-45-3103, Naval Air Systems Command, Washington, D.C., 1979.

Operation and Maintenance Instruction, Volt-Ohm-Milliammeter, 260 Series 6P, NAVSEA 0969-LP-286-1010, Naval Sea Command, Washington, D.C., 1974.

HUNTRON TRACKER 2000

The Huntron Tracker 2000 shown in figure 2-33, is a versatile troubleshooting tool used to statically test resistors, capacitors, inductors, diodes, transistors, multiple-component circuits, and integrated circuits. Its built-in features eliminate the use of multiple pieces of test equipment. These features and its lightweight portability make the 2000 a widely used tool for troubleshooting.

We recommend you review setup and operating procedures discussed in NEETS Module 16, *Introduction to Test Equipment*, NAVEDTRA B72-16-00-96, before continuing with this topic. Since the 2000 was covered in depth in module 16, we will cover only the most common troubleshooting procedures and provide a few troubleshooting tips.

Q30. What two features make the Huntron Tracker 2000 a widely used troubleshooting tool?

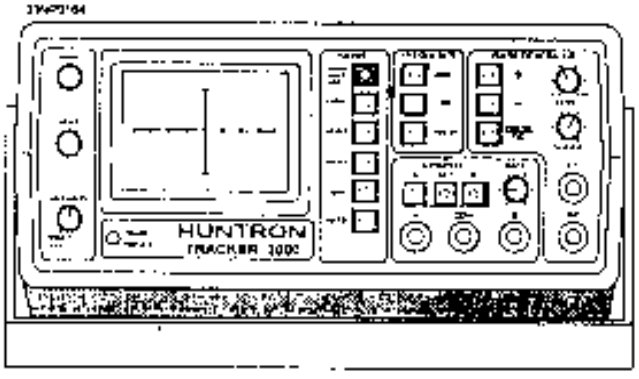


Figure 2-33.—Huntron Tracker 2000.

The Huntron Tracker 2000 has the following features:

- Multiple-test signal frequencies (2000 Hz, 400 Hz, and 50/60 Hz).
- Four impedance ranges (low, medium 1, medium 2, high).
- Automatic range scanning.
- Range control: High Lockout.
- Rate-of-channel alteration and/or range scanning is/are adjustable.
- Dual-polarity pulse generator for dynamic testing of three terminal devices.
- LED indicators for all functions.
- Dual-channel capability for easy comparison.
- Large CRT display with easy-to-operate controls.

CAUTION

The device to be tested must have all power turned off, and have all high-voltage capacitors discharged before connecting the Tracker 2000 to the device.

Testing Components by Comparison

Testing components by comparison is the most preferred method for troubleshooting. The ALT (alternate) mode setup is the most commonly used mode for this method.

This mode allows the technician to compare a known good component to a

suspect component. This is accomplished by connecting channel A to a known good device, channel B to the device under test, and a common test lead to COM as illustrated in figure 2-34. Select the ALT button, and the 2000 will alternately display the signature of the known good device and the device under test. By examining the signature differences, you can detect a defective component. Figure 2-35 is a typical example of the CRT display on the 2000 while testing the base to emitter on a good transistor. Figure 2-36 illustrates a defective transistor under the same test setup. Note that in the low range, the transistor appears to be good. Sometimes component defects are more obvious in one range than another, so if a suspect device appears normal for one range, try the other ranges.

Q31. What is the most preferred method of troubleshooting?

Q32. Why is it recommended to use more than one range while troubleshooting a device?

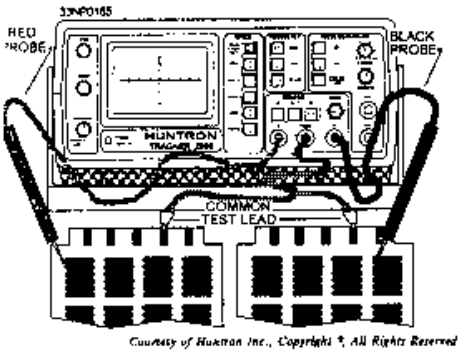


Figure 2-34.—Alternate mode setup.

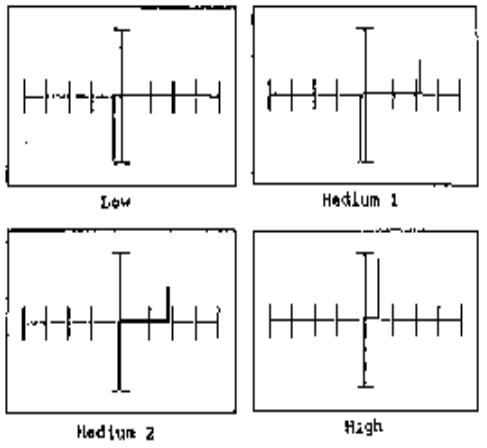


Figure 2-35.—Signatures between base-emitter of a good transistor.

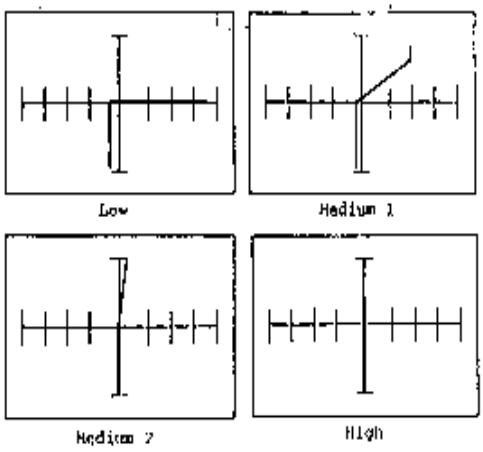


Figure 2-36.—Signatures between base-emitter of a defective transistor.

ANSWER TO QUESTION Q30.

A30. It eliminates the need for multiple pieces of test equipment and it is light-weight and portable.

Troubleshooting Tips

When you are testing individual components in a circuit, a parallel resistor or diode of similar value may cause a defective component to appear good. Therefore, you should, in most cases, electrically isolate the suspected component from the circuit while testing individual components. The best way to do this is to desolder all but one lead on the suspected component.

Q33. When you are testing individual components in a circuit, what may cause a defective component to appear good?

You should be aware that devices made by different manufacturers may appear to have slightly different signatures. This is normal, especially with digital integrated circuits, and does not necessarily indicate a failed device. When this occurs, the best way to verify this is to compare the outputs of the device under test with the equipment specifications to ensure the signals are adequate for proper equipment operation.

ANSWERS TO QUESTIONS Q31. AND Q32.

A31. Testing components by comparison.

A32. Some defective devices may appear to be good in certain ranges.

ANSWER TO QUESTION Q33.

A33. A parallel resistor or diode of similar value.